

Contact Information

Texas A&M University
Department of Mathematics
Blocker Building, College Station, TX 77843.

Email: irinaholmes@math.tamu.edu
Home Page: <https://www.math.tamu.edu/irinaholmes>
Office: Blocker 641G.

Academic Positions

Assistant Professor

Texas A&M University, August 2018 – Present.
(On leave at MSU 2018–2019).

NSF Mathematical Sciences Postdoctoral Research Fellow

Michigan State University, June 2017 – May 2019.

NSF Mathematical Sciences Postdoctoral Research Fellow

Washington University in St. Louis, June 2016 – May 2017.

Hale Postdoctoral Fellow

Georgia Institute of Technology, School of Mathematics, August 2014 – May 2016.

Education

| | | | |
|-------------|-----|-------------|--|
| 2008 - 2014 | PhD | Mathematics | Louisiana State University |
| 2008 - 2010 | MS | Mathematics | Louisiana State University |
| 2004 - 2008 | BS | Mathematics | Louisiana State University (Summa cum Laude) |

Publications

19. Irina Holmes, Sergei Treil, and Alexander Volberg, *Dyadic bi-parameter repeated commutator and dyadic product BMO*, Preprint. [arXiv:2101.00763](https://arxiv.org/abs/2101.00763)
18. Irina Holmes, Sergei Treil, and Alexander Volberg, *Dyadic bi-parameter simple commutator and dyadic little BMO*, Preprint. [arXiv:2012.05376](https://arxiv.org/abs/2012.05376)
17. Nicola Arcozzi, Irina Holmes, Pavel Mozolyako, and Alexander Volberg, *Bi-parameter embedding and measures with restriction energy condition*, *Mathematische Annalen*, **377**, 643 – 674 (2020). [arXiv:1811.00978](https://arxiv.org/abs/1811.00978)
16. Irina Holmes, Paata Ivanisvili, and Alexander Volberg, *The Sharp Constant in the Weak (1,1) Inequality for the Square Function: A New Proof*, *Revista Matematica Iberoamericana*, vol. 36, no. 3, 2020, p. 741+. [arXiv:1710.01346](https://arxiv.org/abs/1710.01346)
15. Nicola Arcozzi, Irina Holmes, Pavel Mozolyako, and Alexander Volberg, *Bellman function sitting on a tree*, *International Mathematics Research Notices*, rnz224, <https://doi.org/10.1093/imrn/rnz224>, [arXiv:1809.03397](https://arxiv.org/abs/1809.03397)
14. Irina Holmes and Alexander Volberg, *Obstacle problems generated by the estimates of square function*, [arXiv:1809.06469](https://arxiv.org/abs/1809.06469) [To appear in Proceedings of the conference “Geometric Aspects of Harmonic Analysis” (Cortona, 25-29 June 2018), series Springer INdAM]
13. Irina Holmes, Stefanie Petermichl, and Brett D. Wick, *Weighted little bmo and two-weight inequalities for Journé commutators*, *Analysis & PDE*, Volume 11, No 7, 2018. [arXiv:1701.06526](https://arxiv.org/abs/1701.06526)
12. Xuan Thinh Duong, Irina Holmes, Ji Li, Brett D. Wick, and Dongyong Yang, *Two weight Commutators in the Dirichlet and Neumann Laplacian settings*, *Journal of Functional Analysis*, Vol. 276, Number 4, 2019. [arXiv:1705.06858](https://arxiv.org/abs/1705.06858)
11. Irina Holmes, Robert Rahm, and Scott Spencer, *Two-Weight Inequalities for Commutators with Fractional Integral Operators*, *Studia Math*, Volume 233, Number 3, 2016. [arXiv:1510.05331](https://arxiv.org/abs/1510.05331)

10. Irina Holmes and Brett D. Wick, *Two Weight Inequalities for Iterated Commutators with Calderón-Zygmund Operators*, Journal of Operator Theory, Vol. 79, No. 1, 2018. [arXiv:1509.03769](#).
9. Irina Holmes, Michael T. Lacey, and Brett D. Wick, *Commutators in the Two-Weight Setting*, Mathematische Annalen, Volume 367, Issue 1–2, 2017. [arXiv:1506.05747](#)
8. Irina Holmes, Michael T. Lacey, and Brett D. Wick, *Bloom's Inequality: Commutators in a Two-Weight Setting*, Archiv der Mathematik, Volume 106, Issue 1, 2016. [arXiv:1505.07947](#)
7. Irina Holmes, Georgios Psaromiligkos, and Alexander Volberg, *A comparison of box and Carleson conditions on bi-trees*, [arXiv:1903.02478](#) [Preprint]
6. Irina Holmes and Ambar N. Sengupta, *The Gaussian Radon Transform in Classical Wiener Space*, Communications on Stochastic Analysis, Volume 8, Number 2, 2014. [CoSA](#)
5. Irina Holmes and Ambar N. Sengupta, *The Gaussian Radon Transform and Machine Learning*, Infinite Dimensional Analysis, Quantum Probability and Related Topics, Volume 18, No. 3, 2015. [arXiv:1310.4794](#)
4. Irina Holmes, *An Inversion Formula for the Gaussian Radon Transform for Banach Spaces*, Infinite Dimensional Analysis, Quantum Probability and Related Topics, Volume 16, No. 4, 2013. [arXiv:1308.1392](#)
3. Irina Holmes and Ambar N. Sengupta, *A Gaussian Radon transform for Banach spaces*, Journal of Functional Analysis, Volume 263, Issue 11, 2012. [arXiv:1208.5743](#)
2. Horst R. Beyer and Irina Holmes, *On a new symmetry of the solutions of the wave equation in the background of a Kerr black hole*, Classical and Quantum Gravity, Vol. 25, No. 13, 2008. [arXiv:gr-qc/0607070](#).
1. Irina Holmes, *On a Problem in the Stability Discussion of Rotating Black Holes*, Proceedings of the National Conference for Undergraduate Research, 2006.

Funding

- ▷ Simons Foundation – Mathematics and Physical Sciences-Collaboration Grants for Mathematicians; “Inequalities in Harmonic Analysis and Multi-Parameter Analysis” 2021–2026; \$42,000.
- ▷ NSF DMS-1900844 “Workshop in Analysis and Probability” – co-PI with David Kerr (PI), Bill Johnson and Eviatar Procaccia; 2019–2022; \$174,000.
- ▷ NSF Mathematical Sciences Postdoctoral Research Fellowship (PI) Award No. 1606270 (June 2016 – May 2018, \$150,000)
- ▷ AMS-Simons Travel Grant (July 1, 2015 – June 30, 2017; \$4,000)

Teaching

| | |
|---|---------------------------|
| <i>MATH 308 - Differential Equations</i> (Sections 506, 507) | TAMU, Fall 2020 |
| <i>MATH 172 - Calculus II</i> (Sections 501, 502) | TAMU, Fall 2019 |
| <i>MTH 132 - Calculus I</i> (Section 43) | MSU, Fall 2018 |
| <i>MTH 133 - Calculus II</i> (Section 60: AP) | MSU, Fall 2017 |
| <i>MATH 2551 - Calculus III</i> (Sections L1 – L3) | Georgia Tech, Spring 2016 |
| <i>MATH 2552 - Differential Equations</i> (Sections F1 – F4; L1 – L4) | Georgia Tech, Fall 2015 |
| <i>MATH 2401 - Calculus III</i> (Sections K1 – K3) | Georgia Tech, Spring 2015 |
| <i>MATH 2401 - Calculus III</i> (Sections D1 – D3) | Georgia Tech, Fall 2014 |
| <i>MATH 1552 - Calculus II</i> (Section 18) | LSU, Fall 2012 |
| <i>MATH 1550 - Calculus I</i> (Section 21) | LSU, Fall 2011 |
| <i>MATH 1550 - Calculus I</i> (Section 30) | LSU, Fall 2010 |
| <i>MATH 1022 - Trigonometry</i> (Sections 4, 13) | LSU, Spring 2010 |
| <i>MATH 1021 - College Algebra</i> (Sections 14, 33) | LSU, Fall 2009 |

Mentoring

- ▷ PhD student: Valentia Fragkiadaki (Texas A&M University); August 2020 - Present.
- ▷ Masters Thesis committee member for Michael Kutzler (University of New Mexico), July 2021.

Invited Talks

AMS Fall Southeastern Sectional Meeting; Special Session Harmonic Analysis and Spectral Theory (via ZOOM);
November 20, 2021.

OARS Online Analysis Research Seminar (via ZOOM);
October 11, 2021.

8th European Congress of Mathematics: Minisymposium in Harmonic Analysis – via Zoom;
June 20–26, 2021; CRM; Slovenia.

Corona Seminar (via ZOOM);
June 3, 2021.

SEAM 2021 (plenary speaker; via ZOOM);
March 13–14, 2021.

Colloquium at UNM (via ZOOM);
October 27, 2020; University of New Mexico, Albuquerque, NM.

Concentration Week: Bellman Function Methods for the Hamming Cube (Organizer, Speaker);
(via ZOOM) August 3-7, 2020; Texas A & M University; College Station, TX.

Harmonic Analysis conference in honor of Michael Lacey's 60th birthday – postponed due to coronavirus;
May 25 – 29, 2020; CRM; Barcelona, Spain.

Rainwater Seminar – postponed due to coronavirus;
April 14, 2020; University of Washington; Seattle, WA.

Johns Hopkins Analysis Seminar – postponed due to coronavirus;
April 6, 2020; Johns Hopkins University; Baltimore, MD.

SEAM 2020 (plenary speaker) – canceled due to coronavirus;
March 13 – 15, 2020; Old Dominion University; Norfolk, VA.

Irina Holmes Fay

Brazos Analysis Seminar;

November 9 – 10, 2019; Baylor University; Waco, TX.

The 40th International Conference on Quantum Probability and Infinite Dimensional Analysis, in honor of Leonard Gross;

August 11 – 16, 2019; The Ohio State University; Columbus, OH.

Analysis and PDE seminar;

April 11, 2019; Purdue University, West Lafayette, IN.

Caltech/UCLA joint analysis seminar;

April 5; Caltech; Pasadena, CA.

Geometric and Harmonic Analysis - Mini-course;

March 28 – 30, 2019; University of Connecticut; Storrs, CT.

Analysis Seminar;

October 17, 2018; Michigan State University; East Lansing, MI.

Workshop in Fourier Analysis;

May 16 – 18, 2018; University of Wisconsin-Madison; Madison, WI.

Analysis Day 2018;

April 28–29, 2018; University of Michigan–Dearborn; Dearborn, MI.

Analysis Seminar at University of Toulouse;

April 9, 2018; Institut de Mathématiques de Toulouse, Toulouse, France.

Analysis Seminar;

March 5, 2018; Brown University; Providence, RI.

Job Talk/Colloquium;

December 15, 2017; Texas A&M University; College Station, TX.

Nonsmooth Analysis: a Workshop for Postdocs;

November 9 – 11, 2017; University of Connecticut; Storrs, CT.

Midwestern Workshop on Asymptotic Analysis;

October 6 – 8, 2017; Indiana University – Purdue University Indianapolis; Indianapolis, IN.

Colloquium – Kent State Math;

September 14, 2017; Kent State University; Kent, OH.

SUMIRFAS 2017;

July 21 – 23, 2017; Texas A&M University; College Station, TX.

Analysis Seminar – UConn;

April 14, 2017; University of Connecticut; Storrs, CT.

MSRI Workshop – Connections for Women: Harmonic Analysis;

January 19 – 20, 2017; MSRI; Berkeley, CA.

Joint Mathematics Meetings of the AMS; AMS Special Session on Operator Theory, Function Theory, and Models; January 4 – 7, 2017; Atlanta, GA.

Harmonic Analysis: Learning Seminar – WUSTL Math;

December 1 and December 8, 2016; Washington University in St. Louis; St. Louis, MO.

Machine Learning Seminar – WUSTL Math;

December 1, 2016; Washington University in St. Louis; St. Louis, MO.

VOTCAM 2016;

October 8, 2016; University of Richmond; Richmond, VA.

Analysis Seminar – University of Alabama;

April 15, 2016; University of Alabama; Tuscaloosa, AL.

Spring Southeastern AMS Sectional Meeting; Special Session on Sharp Estimates and Bellman Functions in Harmonic Analysis; March 5 – 6, 2016; University of Georgia; Athens, GA.

Joint Mathematics Meetings of the AMS;

January 6-9, 2016; Washington State Convention Center; Seattle, WA.

Analysis Seminar at University of Toulouse;

December 14, 2015; Institut de Mathématiques de Toulouse, Toulouse, France.

Analysis Seminar at Clemson;

October 30, 2015; Clemson University; Clemson, SC.

Analysis Seminar at WUSTL;

September 21, 2015; Washington University in St. Louis; St. Louis, MO.

Analysis Seminar at KSU;

September 15, 2015; Kansas State University; Manhattan, KS.

High-Dimensional Phenomena in Statistics and Machine Learning Seminar;

September 2014; Georgia Institute of Technology; Atlanta GA.

Stochastics Seminar;

April 2014; Georgia Institute of Technology; Atlanta GA.

AMS Fall Southeastern Section Meeting;

October 2012; Tulane University; New Orleans LA.

Probability Seminar at LSU;

October 2012; Louisiana State University, Baton Rouge LA.

National Conference for Undergraduate Research;

April 2006; UNC Asheville, Asheville NC.

Service

Conference Organizing:

- ▷ ICERM Semester: “Harmonic Analysis and Convexity” (with Javier Gomez Serrano, Bo’Az Klartag, Alexander Koldobskiy, Sergei Treil, Alexander Volberg, Artem Zvavitch)
ICERM, Providence RI; Sep 7 – Dec 9, 2022.
- ▷ AIM Workshop: “Analysis on the hypercube with applications to quantum computing” (with Paata Ivanisvili and Polona Durcik)
American Institute of Mathematics, San Jose, CA; June 6–10, 2022.
- ▷ AIM SQuaREs (Structured Quartet Research Ensembles) – with Polona Durcik, Paata Ivanisvili, Joris Roos, and Sasha Volberg
First week held online, November 2021.
- ▷ Special Session on “Harmonic Analysis and Applications” – part of the Fall 2021 Meeting of the AMS Western Section in Albuquerque (UNM), co-organizer with Maria Cristina Pereyra.
- ▷ SUMIRFAS 2021 (with Florent Baudier, Bill Johnson, and Eviatar Procaccia)
Texas A&M University, College Station, TX; July 30 – August 1, 2021.

Irina Holmes Fay

- ▷ **SUMIRFAS 2020 – Concentration Week: Bellman Function Methods for the Hamming Cube** (with Sasha Volberg and Paata Ivanisvili)
Texas A&M University, College Station, TX; August 3–7, 2020.
- ▷ **SUMIRFAS 2019** (with David Kerr, Bill Johnson, and Eviatar Procaccia)
Texas A&M University, College Station, TX; July 26–28, 2019.
- ▷ **Special Session on Harmonic Analysis and Applications** (with B. D. Wick)
Spring Southeastern AMS Sectional Meeting, University of Georgia, Athens, GA; March 5–6, 2016.

Outreach:

- ▷ **TAMU Math Circle Beginner Group Activity**, January 25, 2020.
- ▷ **AMUSE** (Applied Mathematics Undergraduate SEminar) Texas A&M, November 18, 2019.
- ▷ Panel member at the **TX-LA Undergraduate Mathematics Conference**; Texas A&M, October 19, 2019.
- ▷ **SEE-Math** (Summer Educational Enrichment in Math) Summer 2019: Instructor for 3-day activity on Probability, attended by 17 middle school students.
- ▷ Research talk and activity at the “**TAMU and Beihang University Exchange Program**” August 2019.

Committee Participation:

- ▷ John J. Koldus III Faculty and Staff Achievement Awards - Spring 2020.

Refereeing: *Advances in Mathematics* (1); *Analysis and Mathematical Physics* (2); *Applied and Computational Harmonic Analysis* (1). *Bulletin of the London Mathematical Society* (1); *Indiana University Mathematics Journal* (1); *Israel Journal of Mathematics* (1); *Journal of Geometric Analysis* (1); *Mathematika* (1); *Mathematische Annalen* (1); *Proceedings of the AMS* (2); *Transactions of the AMS* (1).

Honors and Awards

- ▷ *CETL “Thank a Teacher” Certificate* (Georgia Tech) January 2016 and May 2016.
- ▷ *Distinguished Dissertation Award* (LSU College of Science) April 2015.
- ▷ *LSU Dissertation Year Fellowship* (LSU Graduate School) Academic Year 2013 – 2014.
- ▷ *GAANN Doctoral Fellowship* (LSU Mathematics Department) Academic Years 2010 – 2013.
- ▷ *David Oxley Graduate Teaching Award* (LSU Mathematics Department) Fall 2011.
- ▷ *Certificate of Teaching Excellence* (LSU Mathematics Department) Fall 2010 and Fall 2012.
- ▷ *VIGRE travel support* (LSU Mathematics Department) for travel to the *Random Matrix Theory Graduate Workshop* at MSRI; July 2009.
- ▷ *Robert and Betti Giles Senior Mathematics Award In Recognition of Outstanding Academic Achievement by an Undergraduate Student in the Department of Mathematics* (LSU Mathematics Department) April 2008.
- ▷ *Behre Scientific Writing Award*, second prize.
Awarded by the LSU Chapter of Sigma Xi for the paper “*On a Problem in the Stability Discussion of Rotating Black Holes*”; April 2007.
- ▷ *Academic Excellence Award* (LSU College of Arts and Sciences) April 2007 and 2008.
- ▷ *Herbert Huey McElveen Scholarship* (LSU College of Arts and Sciences) May 2007.
- ▷ *Best Student Researcher at CCT*
Awarded by the Center for Computation and Technology at LSU; August 2006.

▷ *Board of Supervisors Tuition Exemption Scholarship*

Awarded by the Louisiana State University Board of Supervisors; Academic Year 2004-2005.

Workshop Participation

MSRI Workshop - Introductory Workshop: Harmonic Analysis;

January 23 – 27, 2017; MSRI; Berkeley, CA.

Summer School: Paraproducts and Analysis of Rough Paths;

September 11 – 16, 2016; Hausdorff Center for Mathematics, Germany.

Completeness problems, Carleson measures and spaces of analytic functions;

June 29 – July 3, 2015; Institut Mittag-Leffler; Djursholm, Sweden.

Conference on Harmonic Analysis, Function Theory, Operator Theory and Applications;

June 1 – 4, 2015; IMB, University of Bordeaux; Bordeaux, France.

Cornell Summer School in Probability;

July 2013; Cornell University; Ithaca NY.

LSU Workshop in Analysis and Geometry;

January 2011; Louisiana State University, Baton Rouge, LA.

Random Matrix Theory Graduate Workshop at MSRI;

July 2009; MSRI, Berkeley, CA.